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THE TRAIN DEMONSTRATOR OF THE FCH2RAIL PROJECT: FIRST HYDROGEN TRAIN TO PERFORM TESTS ON THE SPANISH RAILWAY NETWORK

- The testing phase in the Spanish tracks has started with the first test run on the Zaragoza-Canfranc line, in the Aragonese Pyrenees and it will continue on lines in Madrid and Galicia.

- The FCH2Rail project is developed by a consortium made up of CAF, DLR, Toyota, Renfe, Adif, CNH2, IP and Stemmann-Technik with a budget of 14 million euros.

The FCH2Rail project, in which a bi-mode demonstrator train with hydrogen fuel cells is being developed, has achieved an important milestone by obtaining authorisation to run in tests on the Spanish National Railway Network, and having completed the first of the routes planned with the arrival of the unit at Canfranc station, in the Aragonese Pyrenees. The demonstrator train is the first hydrogen train to achieve this milestone. This is an outstanding highlight, because the Canfranc line is a particularly demanding line due to its steep and high gradients, which involve a great challenge for the new power generation systems. To this end, the demonstrator train, a Renfe's Civia commuter unit, has run on the Zaragoza-Canfranc line both in electric mode, in the electrified area, and in hybrid mode, combining energy from hydrogen fuel cells and batteries in the non-electrified sections.

A new stage of on-track testing is now underway with the aim of testing the new technology in a wide range of power and energy demand conditions, simulating different commercial services. To this end, the train is scheduled to run on different lines of the Spanish Railway Network, mainly on lines in Aragon, Madrid and Galicia. The test scenarios include running under different climatic and operating conditions. This will allow a more complete characterisation of the new on-board technology, for the subsequent evaluation of the competitiveness of the new bi-mode hybrid propulsion solution with hydrogen fuel cells as a sustainable alternative to the diesel traction currently used on many lines.

The FCH2Rail project is being carried out by a consortium of companies formed by CAF, DLR, Toyota, Renfe, Adif, CNH2, IP and Stemmann-Technik. The demonstrator train is based on one existing Renfe commuter train, in which CAF has installed a new power generation system that uses the hybridisation of energy from hydrogen fuel cells and batteries. This new power system has been integrated into the vehicle's existing traction system. After the static testing phase at the CAF's plant in Zaragoza and the first hydrogen refuelling, the dynamic tests began in mid-2022 on a closed track, which have served to optimise the new power system prior to the current testing phase on representative lines of the Spanish Railway Network. The start of this new testing phase has meant the first authorisation from Adif for the circulation in tests of a hydrogen train on the Spanish Railway infrastructure, passing all the risk analysis and safety validation processes inherent to the testing of new technologies. At the same time, the train

drivers and train managers from Renfe have received the necessary training to drive the CIVIA train converted to a bi-mode hydrogen train.

The success in the development of this project confirms and reinforces the commitment of the companies that make up the FCH2Rail consortium to the development of environmentally friendly mobility solutions. Likewise, the project counts during this stage of the tests on the invaluable collaboration of companies such as IBERDROLA, in terms of the supply of green hydrogen for the train tests, SHIE-ARPA, providing a high-pressure hydrogen dispensing solution, and Ercros, a producer of green H2 for mobility applications, which has facilitated the use of its facilities in Sabiñanigo during the testing stage between Sabiñanigo and Canfranc.

It should be remembered that this is a project that began in early 2021 and is scheduled for completion by the end of 2024. The project has a €14 million budget, 10 million of which is being funded by the Clean Hydrogen Partnership, formerly FCH2 JU, a European Commission agency dedicated to promoting the development of hydrogen and fuel cells.